

CLAIMS

1. A control device for an internal combustion engine that generates power by burning an air-fuel mixture in a
5 cylinder, comprising:

in-cylinder pressure detecting means;

calculating means that calculates a control parameter based on an in-cylinder pressure detected by the in-cylinder pressure detecting means and an in-cylinder
10 volume at the time of detecting the in-cylinder pressure; and

misfire determining means that determines a misfire condition in the cylinder based upon the control parameter calculated by the calculating means.

15

2. The control device for the internal combustion engine according to claim 1, wherein:

the control parameter is a product of the in-cylinder pressure detected by the in-cylinder pressure detecting
20 means and a value obtained by exponentiating the in-cylinder volume at the time of detecting the in-cylinder pressure by a predetermined index number.

3. The control device for the internal combustion
25 engine according to claim 2, wherein:

the calculating means calculates the control parameters in two predetermined points; and

the misfire determining means determines that an inside of the cylinder is in a half-misfire condition when a difference component in the control parameters between the two predetermined points is below a first threshold value.

4. The control device for the internal combustion engine according to claim 3, wherein:

the misfire determining means determines that the inside of the cylinder is in a complete-misfire condition when the difference component in the control parameters between the two predetermined points is below the first threshold value and also below a second threshold value, which is smaller than the first threshold value.

5. The control device for the internal combustion engine according to claim 3, wherein:

one of the two predetermined points is set at a point after an intake valve opens and also before combustion starts, and the other is set at a point after the combustion starts and also before an exhaust valve opens.

6. A method for determining a misfire in an internal combustion engine that generates power by burning an air-fuel mixture in a cylinder, comprising:

- (a) a step of detecting an in-cylinder pressure;
- (b) a step of calculating a control parameter based

on the in-cylinder pressure detected in the step (a) and an in-cylinder volume at the time of detecting the in-cylinder pressure; and

(c) a step of determining a misfire condition in the cylinder based on the control parameter calculated in the step (b).

7. The method for determining a misfire in the internal combustion engine according to claim 6, wherein:
the control parameter is a product of the in-cylinder pressure detected in the step (a) and a value obtained by exponentiating the in-cylinder volume at the time of detecting the in-cylinder pressure by a predetermined index number.

15

8. The method for determining a misfire in the internal combustion engine according to claim 7, wherein:
in the step (b), the control parameters are calculated in two predetermined points; and
in the step (c), it is determined that an inside of the cylinder is in a half-misfire condition when a difference component in the control parameters between the two predetermined points is below a first threshold value.

9. The method for determining a misfire in the internal combustion engine according to claim 8, wherein:
in the step (c), it is determined that the inside of

the cylinder is in a complete-misfire condition when the difference component in the control parameters between the two predetermined points is below the first threshold value and also below a second threshold value, which is smaller
5 than the first threshold value.

10. The method for determining a misfire in the internal combustion engine according to claim 8, wherein:
one of the two predetermined points is set at a point
10 after an intake valve opens and also before combustion starts, and the other is set at a point after the combustion starts and also before an exhaust valve opens.